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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/005,006	01/09/1998	SHUICHI KANNO	ASA-695	1954

7590 12/23/2003  
CROWELL & MORING LLP  
P.O. Box 14300  
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EXAMINER

NGUYEN, NGOC YEN M

ART UNIT	PAPER NUMBER
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1754

DATE MAILED: 12/23/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/005,006

Applicant(s)

KANNO ET AL.

Examiner

Ngoc-Yen M. Nguyen

Art Unit

1754

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 10 November 2003.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 40-51 and 75-79 is/are pending in the application.
- 4a) Of the above claim(s) 75-79 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 40-51, 79 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. §§ 119 and 120**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.  
a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

### DETAILED ACTION

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on November 10, 2003 has been entered.

In this office action, the species of C-F as the compound in the gas stream and aluminum oxide-nickel oxide catalyst are being examined. These species were elected without traverse in Paper No. 6 (filed July 26, 1999). Since there is no clear request from Applicants to shift to other species when filing the request for continued prosecution application, only the originally elected species are treated on the merit in this office action.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 40-43, 45-49, 51, 79 are rejected under 35 U.S.C. 103(a) as obvious over Rossin et al (6,069,291), optionally in view of Okazake et al (5,151,263) and Imamura (5,649,985).

Rossin '291 discloses a process for the decomposition of perfluoroalkanes to HF and CO<sub>2</sub> (note claim 1). The process comprises contacting the perfluoroalkanes with aluminum oxide. The perfluoroalkane is contacted with aluminum oxide at a temperature ranging from about 400°C to about 1000°C, or preferably from about 550°C to 800°C (note column 2, lines 55-65). This range is well within the claimed range. The decomposition temperature of C<sub>2</sub>F<sub>6</sub> is 750°C (note Example 1. This value is well within the claimed range.

Rossin '291 discloses that perfluoroalkanes are CF<sub>4</sub>, C<sub>2</sub>F<sub>6</sub>, etc. (Note column 1, lines 25-28). Rossin '291 discloses, in Example XIX, a concentration of 5,000 ppm (= 0.5 %) tetrafluoromethane (CF<sub>4</sub>) in the gas to be treated. This value is well within the claimed range. For the other values of the claimed range, Rossin '291 does disclose any limit the concentration of the perfluoroalkane in the gas to be treated. Thus, it would have been obvious to one of ordinary skill in the art to use the process of Rossin '291 to treat any exhaust gas, which contains perfluoroalkanes, especially the gas generated during electrolytic aluminum smelting, tetrafluoroethylene manufacture, and during semiconductor manufacture (note column 3, lines 48-54).

The aluminum oxide is stabilized, for example, with an element selected from the group consisting of barium, calcium, nickel among others (note sentence bridging columns 2-3). The catalyst is formed by slurring pseudoboehmite aluminum oxide (which is encompassed by the claimed "boehmite") in an aqueous or non-aqueous liquid. Once mixed, one or more additional components may be added to the slurry. These additional components may be added as solid metal salts, such as nitrates, acetates, oxalates, chlorides, halides, etc., or may be added as small metal or metal oxide particles. Once mixed, the slurry may be aged, if desired, or used directly in the manufacture of beads, particles, spheres, etc., or used to coat an inert ceramic

substrate, such as a monolith. Following manufacture or coating of the inert ceramic substrate, the resulting material must be calcined at a temperature between 350 and 900°C (note column 4, lines 36-55). The calcination would convert the additional components into oxide forms if they are not already were.

Rossin '291 further discloses that the process is also applicable to the injection of gaseous or liquid phase perfluoroalkanes into a gas stream, including an oxidizing agent, such as air for example, and water (which would become steam at reaction temperature) (note column 5, lines 28-37 and column 3, lines 8-11).

In Rossin '291, since Ni is specifically disclosed as one of the additional components that can be added to the aluminum oxide catalyst, thus, the disclosure of Rossin is considered as having "sufficient specificity" to include alumina-nickel oxide catalyst.

In any event, it would have been obvious to one skilled in the art to select any combination among the specifically disclosed compounds, i.e. nickel-aluminum oxide, *Merck & Co. Inc. v. Biocraft Laboratory Inc.* 10 USPQ 1846.

Rossin further discloses that if the concentration of hydrofluoric acid in the effluent stream is deemed unacceptable, conventional collection or abatement process, such as caustic scrubbing, may be employed to avoid venting acid gases directly into the atmosphere (note column 5, lines 44-48). The processes steps as required in the instant claims for removing HF from the exhaust gases are conventional and well known steps in the art.

For claim 79, Rossin discloses that perfluoroalkanes are released to the environment during certain industrial processes, such as during semiconductor manufacturing processes (note column 1, lines 21-30). Thus, It would have been obvious to one of ordinary skill in the art at the time of the invention was made to treat

any perfluoroalkanes which were released from any semiconductor manufacturing process, including when such perfluoroalkanes were used as etchants or cleaners for semiconductor processes.

Optionally, Imamura '985 is applied to teach that HF is a water soluble component (note column 6, lines 48-49) and it can easily be removed by scrubbing with water (note claim 1).

Optionally, Okazaki '263 can also be applied to teach that acid compounds such as HCl, HF can be absorbed and neutralized by alkali (note column 4, lines 31-34).

Rossin discloses that the catalyst composition comprises aluminum oxide with the addition of between 0.01 and 50% of one or more elements selected from the group consisting of nickel among others (note paragraph bridging columns 3-4). The composition of the catalyst recited in Rossin '291 is stated in weight percent and were calculated based upon the elements described. When the metal component or components were added by wet impregnation techniques, the weight percent of the metal(s) within the impregnation solution and the amount of impregnation solution used to prepare the catalyst. When the metal component or components were added to the aluminum oxide precursor slurried in water, the weight percent of the metal component(s) were calculated from the amount of aluminum oxide precursor and the amount of metal(s) present within the slurry, and the weight loss upon ignition of the aluminum oxide precursor (note column 6, lines 1-15). Rossin does not specifically disclose the atomic ratio.

However, from the weight percent, one skilled in the art can calculate to figure out the atomic ratio. In Example IV, using 60 g/mole as the molecular weight for the pseudoboemite "AlO(OH)", and 148.3 g/mole for the magnesium nitrate, the atomic ratio

of Al:Mg is calculated out to be about 49:1. In Example XIII, using 159 g/mole for the zirconium hydroxide, the atomic ratio of Al:Zr is calculated out to be about 2.65:1. These values are within the claimed range. Even though, Rossin '291 does not use nickel as the metal component in any of the Examples, however, one skilled in the art would have reasonably expected that the mole ratio of Al to Ni and any Zn would also be within the claimed range. Moreover, it would have been obvious to one of ordinary skill in the art to optimize the atomic ratio of aluminum to nickel based on the disclosed range stated above to obtain a catalyst best suited for transforming perfluoroalkanes.

Claims 44, 50 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rossin '291 as applied to claims 40-43, 45-49, 51, 79 above, and further in view of Rosenbaum (5,460,792).

The difference not yet discussed is Rossin '792 does not disclose the addition of zinc oxide.

Rosenbaum '792 discloses a process for the destruction of hydrocarbon compounds, which uses a catalyst comprising a carbonaceous pyrolyzed resinous polymer. The catalyst is doped with a compound selected from the group consisting of metal oxides, metal oxyhalides or precursor metal salts wherein the metal of the metal oxides, metal oxyhalides and precursor metal salts is selected from the group consisting of Sc, Ti, V, Cr, Mn, Fe, Co, Ni, Co, Zn, Pd, Nb, Zr, Mo and mixtures thereof (note claim 1). Rosenbaum '792 further discloses that the process can be used for the destruction of organic compounds, which refer to either halogenated organic, or hydrocarbon compounds or mixture thereof (note column 4, lines 15-18). Exemplified compounds, which can be destroyed, are  $C_2Cl_4$ ,  $CCl_4$  (note column 6, lines 6 and 9), Rosenbaum

'792 teaches that the halide can be any halide, while chlorine and bromine are being preferred (note column 7, lines 28-26).

It would have been obvious to one of ordinary skill in the art at the time of the invention was made to further include zinc in the catalyst of Rossin '792 because Rosenbaum '792 suggests that zinc, just as nickel, would promote the destruction of the halogenated hydrocarbon.

Applicant's arguments and declaration filed November 10, 2003 have been fully considered but they are not persuasive.

Applicants argue that Rossin '291 does not disclose or suggest catalysts that are effective for treatment of fluorine compounds in concentrations of 5000 ppm (0.5%) or higher, as required by Applicants' claims.

As stated in the above rejection, in Example XIX, Rossin '291 does disclose a concentration of 5,000 ppm. Furthermore, Rossin '291 does not disclose that the process should be limit to just low concentration of perfluoroalkanes. Thus, it would have been obvious to one skilled in the art to apply the process of Rossin '291 to decompose perfluoroalkanes in any exhaust gas, especially the one came from a semiconductor process, regardless of the concentration of the perfluoroalkanes.

Applicants argue that Rossin '291 provides no working examples at all of an aluminum oxide that also contains nickel.

It should be noted that the teaching of Rossin '291 should not be limited to just the examples. Rossin '291 fairly teaches that nickel is one of the suitable elements that can be included in the catalyst beside aluminum oxide (note paragraph bridging columns 3-4).



Applicants argue that in the second declaration from Mr. Kanno, the Zr-Co-Al oxide catalyst as disclosed in Example XVI of Rossin was effective for conversion of over 99% of a gas stream containing 500 ppm of fluorine containing gas for time periods well in excess of 400 hours, however, at higher fluorine containing gas concentrations, the Zr-Co-Al catalyst quickly lost its effectiveness.

It is noted that Figures 1 and 2 cannot be found in the second declaration of Mr. Kanno. As stated in the above rejection, in Example XIX, the process of Rossin is used to treat a gas containing 5000 ppm with the conversion % of 97.4 (note Table in column 13). In any event, the showing in the second declaration is not persuasive because it is not commensurate in scope with the claims, Applicants' claims do not require any % for the conversion effectiveness or any time duration for the process.

The rejection over Rossin in view of Rosenbaum is maintained for the same reasons as stated above.

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Ngoc-Yen Nguyen whose telephone number is (571) 272-1356. The examiner is currently on a part time schedule.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mr. Stanley Silverman, can be reached on (703) 272-1358. The fax phone number for this Group is (703) 872-9311 (for OFFICIAL After Final amendment only) or

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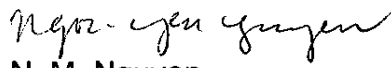
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(703) 872-9310 (for all other OFFICIAL faxes). UNOFFICIAL fax can be sent to (703) 305-6078.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 308-0661.

N. M. Nguyen  
12/13/03

  
N. M. Nguyen  
Primary Examiner  
Art Unit 1754